CLAIMS

What is claimed is:

1. A method for performing stateful signaling transactions in a distributed processing environment, the method comprising:

(a) receiving a first signaling message;

(b) forwarding the first signaling message to a first stateful processing module of a plurality of stateful processing modules;

(c) at the first stateful processing module:

(i) generating a stateful transaction query message based on the first signaling message message;

(ii) inserting an identifier in the stateful transaction query message for identifying the first stateful processing module; and

(iii) forwarding the stateful transaction query message to a destination; and

(d) receiving a response to the stateful transaction query message, the response including the identifier; and

(e) using the identifier to distribute the response to the first stateful processing module.

2. The method of claim 1 wherein receiving a first signaling message includes receiving a first transaction capabilities application part (TCAP) query message and wherein the method further comprises buffering the first TCAP query message at the first stateful processing module.

3. The method of claim 2 wherein formulating a stateful transaction query message includes formulating a second TCAP query message based on the first TCAP query message.

4. The method of claim 1 wherein receiving a first signaling message includes receiving an ISDN user part (ISUP) message and wherein the method further comprises buffering ISUP message at the first stateful processing module.

5. The method of claim 4 wherein formulating a stateful transaction query message includes formulating a transaction capabilities application part (TCAP) query message based on the ISUP message.

6. The method of claim 1 wherein receiving a first signaling message includes receiving an IP telephony signaling message and wherein the method further comprises buffering the IP telephony signaling message at the first stateful processing module.

7. The method of claim 6 wherein formulating a stateful transaction query message includes formulating a transaction capabilities application part (TCAP) query message based on the received IP telephony signaling message.

8. The method of claim 1 wherein forwarding the first signaling message to a first stateful processing module of a plurality of stateful processing modules includes selecting the first stateful processing module from the plurality of stateful processing modules using a load sharing algorithm.

9. The method of claim 1 where inserting an identifier in the stateful transaction query message includes placing the identifier in a field in

the stateful transaction query message for causing the destination to insert the identifier in the response.

10. The method of claim 9 wherein the stateful transaction query message comprises a transaction capabilities application part (TCAP) message and the field comprises a transaction identifier field in the TCAP message.

11. The method of claim 1 wherein receiving a response to the stateful transaction query message includes receiving the response at a link interface module and wherein using the identifier to distribute the response to the first stateful processing module includes decoding the identifier at the link interface module and sending the response to the stateful processing module corresponding to the identifier.

12. The method of claim 1 wherein receiving a response to the stateful transaction query message includes receiving the response at a link interface module and wherein using the identifier to distribute the response to the first stateful processing module includes forwarding the response to a second stateful processing module using a load sharing algorithm and, at the second stateful processing module, decoding the identifier and forwarding the stateful transaction query message to the first stateful processing module.

13. The method of claim 1 wherein receiving a response to the stateful transaction query message includes receiving the response at a link interface module and wherein using the identifier to distribute the response to the first stateful processing module includes forwarding the response to a distribution module, and, at the distribution module,

decoding the identifier and forwarding the stateful transaction query message to the first stateful processing module.

14. The method of claim 1 comprising inserting stateful transaction location information in the stateful transaction query message, extracting the stateful transaction location information from the response, and using the stateful transaction database location information to locate data associated with the stateful transaction.

15. The method of claim 1 comprising formulating a transaction detail record (TDR) based on the stateful transaction.

16. The method of claim 1 wherein steps (a)-(e) are performed at a signal transfer point (STP).

17. The method of claim 1 wherein the stateful transaction query message and the response comprise IP-based messages.

18. The method of claim 1 wherein generating a stateful transaction query message includes generating a plurality of stateful transaction query messages, wherein receiving a response includes receiving a response to each query message, and wherein using the identifier to distribute the response includes using the identifier to distribute the response to each query message.

19. The method of claim 1 wherein receiving a response to the stateful transaction query message includes receiving multiple responses to the stateful transaction query message, each response including the identifier, and wherein using the identifier to distribute the response to the first stateful processing module includes using the identifier to distribute each response to the first stateful processing module.

20. The method of claim 1 wherein forwarding the stateful transaction query message to a destination includes inserting an entity address of a first signal transfer point of a mated pair of signal transfer points in the stateful transaction query message, forwarding the stateful transaction query message from the first signal transfer point to the destination and wherein receiving the response includes receiving the response at a second signal transfer point of the mated pair of signal transfer points, decoding the response and extracting an entity address from the response, determining that the entity address corresponds to the first signal transfer point, and forwarding the response to the first signal transfer point.

21. A telecommunications network element comprising:

(a) a link interface module for receiving signaling messages and for forwarding predetermined signaling messages to one of a plurality of stateful processing modules using a load sharing algorithm; and

(b) a plurality of stateful processing modules, each stateful processing module being adapted to identify signaling messages received from the link interface module as stateful transaction trigger messages or stateful transaction response messages, and, in response to receiving a stateful transaction trigger message, each stateful transaction processing module is adapted to formulate a stateful transaction query message and to insert a stateful processing module identifier in the query message.

22. The telecommunications network element of claim 21 wherein the link interface module comprises an SS7 link interface module for sending and receiving SS7 messages and for forwarding signaling connection control part (SCCP) messages to the stateful processing modules.

23. The telecommunications network element of claim 21 wherein the link interface module comprises an IP telephony link interface module for sending and receiving IP telephony signaling messages and for forwarding predetermined IP telephony signaling messages to the stateful processing modules.

24. The telecommunications network element of claim 21 wherein the link interface module is adapted to forward a first signaling message to a first stateful processing module using a load sharing algorithm and wherein the first stateful processing module is adapted to forward the first signaling message to a second stateful processing module in response to determining that the first signaling message is associated with a stateful transaction initiated by the second stateful processing module.

25. The telecommunications network element of claim 21 wherein each stateful processing module is adapted to formulate stateful transaction query messages in response to received transaction capabilities application part (TCAP) messages.

26. The telecommunications network element of claim 21 wherein each stateful processing module is adapted to formulate stateful transaction query messages in response to received ISDN user part (ISUP) messages.

27. The telecommunications network element of claim 21 wherein each stateful processing module is adapted to formulate stateful transaction query messages in response to received IP telephony signaling messages.

28. The telecommunications network element of claim 21 wherein each stateful processing module is adapted to place its stateful processing module identifier in a field in the stateful transaction query message that will cause a destination for the stateful transaction query message to insert the stateful processing module identifier in a response to the query message.

29. The telecommunications network element of claim 28 wherein the stateful transaction query message comprises a transaction capabilities application part (TCAP) message and the field comprises a transaction identifier field.

30. The telecommunications network element of claim 21 comprising a centralized distribution module for distributing stateful transaction query and response messages to the stateful processing modules, wherein the link interface module is adapted to forward received signaling messages to the distribution module.

31. The telecommunications network element of claim 21 wherein the link interface module and the stateful transaction processing modules are components of a signal transfer point (STP).

32. The telecommunications network element of claim 21 wherein the stateful processing modules are each adapted to insert stateful transaction data location information in stateful transaction query

messages, to extract the stateful transaction data location information from received stateful transaction response messages, and to use the stateful transaction data location information extracted from the response messages to locate data associated with each stateful transaction.

33. The telecommunications network element of claim 21 wherein each stateful processing module is adapted to formulate transaction detail records for stateful transactions that it originates.

34. A computer program product comprising computer executable instructions embodied in a computer readable medium for performing steps comprising:

(a) receiving a signaling message;

(b) determining whether the signaling message comprises a stateful transaction trigger message;

(c) in response to determining that the signaling message comprises a stateful transaction trigger message, formulating a stateful transaction query message based on the stateful transaction trigger message;

(d) inserting a stateful processing module identifier in the stateful transaction query message, the stateful processing module identifier identifying a stateful processing module that originates the stateful transaction query message; and

(e) sending the stateful transaction query message to a predetermined destination.

35. The computer program product of claim 34 wherein receiving a signaling message comprises receiving an ISDN user part (ISUP) signaling message and wherein formulating a stateful transaction query message includes buffering the ISUP message and formulating a transaction capabilities application part (TCAP) message based on the ISUP message.

36. The computer program product of claim 34 wherein receiving a signaling message includes receiving a first transaction capabilities application part (TCAP) message and wherein formulating a stateful transaction query message includes buffering the first TCAP message and formulating a second TCAP message based on the first TCAP message.

37. The computer program product of claim 34 wherein receiving a signaling message includes receiving an IP telephony signaling message and wherein formulating a stateful transaction query message includes formulating a transaction capabilities application part (TCAP) message based on the IP telephony signaling message.

38. The computer program product of claim 34 wherein inserting a stateful processing module identifier in the stateful transaction query message includes inserting the stateful processing module identifier in a field in the query message that causes a recipient of the query message to insert the stateful processing module identifier in a response to the query message.

39. The computer program product of claim 38 wherein the stateful transaction query message comprises a transaction capabilities

application part (TCAP) query message and the field comprises a transaction identifier field in the TCAP query message.

40. The computer program product of claim 34 comprising receiving a response to the stateful transaction query message, the response including the stateful processing module identifier, and using the stateful processing module identifier to distribute the response to the stateful processing module that originated the stateful transaction query message.